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Report on the United Nations/Austria/European Space Agency Symposium on Enhancing the Participation of Youth in Space Activities

(Graz, Austria, 11-14 September 2000)

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I. Introduction

A. Background and objectives

1. In its resolution 54/68 of 6 December 1999, the General Assembly endorsed the resolution entitled "The Space Millennium: Vienna Declaration on Space and Human Development",[1] which had been adopted by the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). UNISPACE III had formulated the Vienna Declaration as the nucleus of a strategy to address global challenges in the future. Part of that strategy called for actions to create, within the framework of the Committee on the Peaceful Uses of Outer Space, a consultative mechanism to facilitate the continued participation of young people from all over the world in cooperative space-related activities.

2. In his report of 10 January 2000 to the Committee and its Scientific and Technical Subcommittee (A/AC.105/730), the Expert on Space Applications proposed the organization of a symposium to promote the participation of young people in space activities as part of the programme of workshops, training courses, symposia and conferences of the United Nations Programme on Space Applications for 2000. In its report, the Committee endorsed the organization of such a symposium.[2]

3. The present report contains a summary of the presentations and discussions of the United Nations/Austria/European Space Agency Symposium on Enhancing the Participation of Youth in Space Activities, held from 11 to 14 September 2000 in Graz, Austria. The symposium, the seventh in a series of symposia held in Graz, was organized as part of the 2000 activities of the United Nations Programme on Space Applications and was co-sponsored by the Federal Ministry for Foreign Affairs of Austria, the State of Styria, the City of Graz, the Federal Ministry for Transport, Innovation and Technology of Austria and the European Space Agency (ESA).

4. The 2000 symposium was the first of a series of three consecutive symposia dealing with the participation of young people in space activities. It provided young people with a forum to express their unique and innovative ideas and visions for turning some of the recommendations of UNISPACE III into reality. At the same time, it provided opportunities for young people to discuss how education and training, in particular among youth, should be addressed. The next two meetings will build on the outcomes of the 2000 symposium.

5. The aim of the symposium was to bring together major space education and outreach groups in order (a) to define mechanisms to coordinate activities and share information; (b) to identify activities to assess the status of space education in various countries; (c) to specify benefits that could be gained from furthering space education; and (d) to determine the appropriate institutions to be involved in furthering space education, as well as how this could be achieved. The symposium was also intended to establish a consultative mechanism between young people and the Committee on the Peaceful Uses of Outer Space, as indicated in paragraph 1 above.

6. The present report covers the background and objectives of the symposium, as well as the discussions held, action taken and recommendations made by the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fourth session and to its Scientific and Technical Subcommittee at its thirty-eighth session, in 2001. The proceedings of the symposium, including a detailed list of participants, will be prepared by the Office for Outer Space Affairs in due course.

B. Programme

7. At the opening of the symposium statements were made by representatives of the United Nations, ESA and the host country. The keynote addresses were given by Karl Doetsch, President of the International Space University (ISU), and James Moody, Co-facilitator of the Youth Advisory Council (an interim mechanism established as a result of recommendations made by the Space Generation Forum during UNISPACE III). The programme was divided into sessions on education and outreach; developing a career in space; and follow-up to the recommendations of UNISPACE III and parallel sessions of the working groups of the Space Generation Advisory Council. The presentations by invited speakers and working group sessions were followed by panel discussions.

8. Presentations were made by representatives of ISU, the European Association for the International Space Year (EURISY), ESA, the National Space Society of the United States of America, SPACEHAB, the National University of San Juan (Argentina), Moi University (Kenya), LunarSat, Admatis, the Association for Space Technology of Argentina, GeoVille, the Technical University of Graz, the Scientific Advisory Committee of the African Centre of Meteorological Applications for Development (ACMAD), the Chinese Academy of Space Technology (CAST), AeroAstro, the Office for Outer Space Affairs and the Youth Advisory Council.

9. An evening lecture on "Can Space Matter?" by Rick Fleeter, President of AeroAstro, and a round table on the societal implication of astrobiology, organized by the Astrobiology Integration Office, Ames Research Center, of the National Aeronautics and Space Administration (NASA) of the United States were held as special events in addition to the programme of the symposium.

C. Attendance

10. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate suitable candidates under the age of 35 for participation in the symposium. Selected participants were required to have a university degree or well-established working experience in a field related to the overall theme of the meeting. They should also be working in programmes, projects or institutions that conducted education or outreach activities or with space-related companies. Students without university degree or professional working experience were accepted if they were actively involved in space-related activities in their home countries or in the Space Generation Advisory Council or if they had been actively involved in the work of the Space Generation Forum during UNISPACE III.

11. Funds allocated by the Government of Austria and ESA were used to cover the travel and living expenses of participants mainly from developing countries. In total, approximately 80 space experts attended the symposium.

12. The symposium was attended by participants from Argentina, Australia, Austria, Azerbaijan, Bangladesh, Brazil, Burundi, Canada, Chile, China, Cuba, Denmark, France, Ghana, Honduras, Hungary, Indonesia, Kazakhstan, Kenya, the Libyan Arab Jamahiriya, Luxembourg, the Niger, Pakistan, the Philippines, the United Republic of Tanzania, the Netherlands, Turkey, the United Kingdom of Great Britain and Northern Ireland, Uruguay and the United States.

II. Observations based on the presentations and recommended activities

A. Observations, activities to date and accomplishments

13. Discussions at the symposium focused on the participation of youth in space activities, noting that young people the world over were fascinated by the realm of space. It was emphasized that, through their enthusiasm in the area, young people could provide current leaders and decision makers with innovative ideas and contributions. This had been demonstrated at the Space Generation Forum during UNISPACE III, when over 150 young people from more than 60 States had made recommendations for the benefit of humanity that had ultimately been included in the Vienna Declaration. In addition, young people stood to benefit from space: space inspired them, creating a desire for knowledge, and could therefore be used as a motivator for learning.

14. Participants were given a broad view of the methods and programmes by which young people could both benefit from and contribute to space and in particular how to utilize space for the benefit of humanity. Information was provided on new programmes of interest to young people, career opportunities, a forum for their views and an opportunity to further their efforts in order to energize and mobilize young people around the world.

15. The sessions on education and outreach provided participants with information regarding several initiatives from around the world, including government, private sector and institutional programmes. Discussions following those sessions led to the conclusion that there was insufficient support for space activities and science education in general and for young people in particular. There was also agreement that it was

imperative to develop lines of action in order to obtain more political support.

16. The sessions on space careers presented the participants with the broad range of challenges facing young people in their professional space careers. The challenges of space utilization and exploration had an impact on human resource aspects, in particular on capacity-building. Since access to space was costly, activities tended to cluster both geographically and in particular fields. This created an imbalance in the opportunities available. While some States were struggling to fill their high-technology positions, in others there were few opportunities for enterprising individuals. Presentations were made by entrepreneurs demonstrating the ability to create opportunities for oneself. The International Space Station, where permanent human habitation was about to begin, might create new opportunities for young people with innovative ideas.

17. The participants, including several who had participated in the Space Generation Forum during UNISPACE III, held special organizational sessions during the symposium. At the close of the symposium, participants announced the end of the interim status of the Youth Advisory Council and the formal constitution of the United Nations Programme on Space Applications Space Generation Advisory Council. The new Council was intended to give the young people of the world a forum for communication, a coordination mechanism and a voice in space issues. Members of the Council continued their initiatives started at UNISPACE III, forming working groups and an interim council. The working groups identified issues of importance to youth, as well as obstacles to their greater participation in space activities, and began the task of identifying solutions to overcome those obstacles. Some of the working groups had already begun implementation of activities prior to the symposium.

18. The challenge of having their work and its results recognized, appreciated and supported by large formal organizations, whether governmental, institutional or business, was identified by participants as a serious impediment to full exploitation of their efforts.

19. The symposium made recommendations to the Council on the procedure and possible mechanisms to provide input to the Committee on the Peaceful Uses of Outer Space and on the role of the Council in coordinating activities worldwide, including its tasks and responsibilities. The statutes and a work plan of the Council will be presented to the Scientific and Technical Subcommittee at its thirty-eighth session, in February 2001.

20. One of the first official acts of the newly constituted Council was performed by a group of representatives of Latin American and Caribbean States, who established the Latin American Space Association (ALE). During the symposium, the official charter of ALE was signed by nine representatives of seven countries of Latin America and the Caribbean, Argentina, Brazil, Chile, Colombia, Cuba, Honduras and Uruguay. The purpose of the Association is to promote the development of space activities in the region by (a) fostering the participation of young Latin Americans in joint space projects; (b) creating awareness of the benefits of space technology in developing countries; (c) providing information on scholarships, internships, exchange programmes and grants for space studies and training; (d) organizing educational and outreach activities; and (e) implementing cooperation and communication agreements with universities and space-related organizations.

B. Recommended action

21. The working groups of the Youth Advisory Council started their work shortly after UNISPACE III using virtual discussion forums on the web page of the Council. Those discussions were summarized by the working group moderators and presented in the sessions of the respective working groups during the symposium. During those sessions the participants discussed existing ideas and came up with new ones to identify long- and short-term plans of action. Those work plans and recommended activities are included in section III.C of the present report.

22. Recognizing the contributions of the Space Generation Advisory Council, it was recommended that support for the organization continue. Close coordination between the Council and the Office for Outer Space Affairs should continue to the mutual benefit of both bodies and should include regular communication and synergistic efforts to address issues of education, outreach and other concerns of young people.

23. The participants in the symposium had demonstrated their contributions to the space field through their perseverance and accomplishments over the year

since UNISPACE III. Continued support by the Office for Outer Space Affairs in aiding the young people, through mechanisms like the Council, in identifying and obtaining support could be beneficial to both.

24. The Office for Outer Space Affairs, in the context of follow-up to UNISPACE III, should continue to encourage the involvement of young people in space activities. Continued support for symposia provided forums for interpersonal exchanges between young people, as well as cross-generational exchanges. Such symposia created an environment for learning, productivity and networking that contributed to achieving the goals of UNISPACE III and should therefore be continued in the coming years.

III. Presentations and discussions

25. The overall theme of the symposium was introduced by the two keynote speakers, who represented the views of youth and educational institutions.

A. Sessions 1 and 2. Education and outreach

26. The sessions on space education and outreach provided an overview of ongoing efforts of individuals and organizations to achieve increased public awareness, specifically through educational systems as well as by means of extracurricular educational activities for young people.

27. Wubbo Ockels, of ESA, made a presentation entitled "The Educational Project Outreach Activities". Those activities included student parabolic flight campaigns and an international physics teaching initiative called "Physics on Stage", as well as other activities. Patricia Dash, of the National Space Society of the United States, underlined the importance of training teachers in international, intercultural and interdisciplinary aspects in her talk on space activism and public education.

28. Peter Brøgger Sørensen, on behalf of EURISY, provided insight into the new European outreach Internet project EUROSEE, which brings remote sensing issues directly into schools. Astronaut Bernard Harris gave an overview on the space company SPACEHAB, a commercial entity that provides educational opportunities for students all over the world to participate in the design of experiments to fly on the Space Shuttle and eventually on the International Space Station. Graciela Salinas Salmuni, of the University of San Juan, made a presentation entitled "Educational and Dissemination Activities in Remote Sensing Towards the Community: An Example in Argentina". The project brings remote sensing awareness and education into schools. The presentation by Gernot Groemer introduced the lunar mission LunarSat, the aim of which is to involve more than 50,000 European students. The micro-orbiter LunarSat will investigate the lunar south pole for its suitability for the first permanent human outpost.

29. A panel discussion followed the presentations. It brought to light possible causes for the lack of political awareness on the part of the scientific community, one reason being the apparent unawareness among the space outreach community of how government resource allocation worked. Another issue discussed was the reservation of scientists in approaching the public.

B. Sessions 3 and 4. Developing a career in space

30. Career opportunities were necessary to motivate young people to pursue a space career. While the space sector had always been considered a high-technology sector at the forefront of research and technology, space was now competing for the attention of young people with other quickly growing high-technology fields, such as e-commerce and the biotechnology sectors. To ensure that the benefits of space technology applications were fully utilized, especially in the developing countries and emerging space nations, young people needed to be attracted to the field by offering adequate space education and job opportunities. The presentations during sessions 3 and 4, summarized below, were chosen to provide examples of space career paths in various regions of the world.

Possibilities for a career in space: present and future

31. Pablo de Leon, President of the Association for Space Technology of Argentina, gave an overview presentation on the Association's activities, including the design of hybrid rocket propulsion systems, microgravity research activities and receivers for satellite navigation systems.

32. The example showed that an emerging space nation could become a viable player and a respected partner in space cooperation. It often took only one single, committed person to make a difference and to bring about positive change. Commitment and endurance were required to be successful in the space sector.

An insight into a space company

33. Norbert Babscan, Assistant Professor at the University of Miskolc (Hungary) and research and development manager of ADMATIS (Advanced Materials in Space), made a presentation concerning the field of applied micro-gravity research. While micro-gravity activities had been hailed as promising tremendous advances in medical, biological and materials research, the results obtained so far were far less convincing. There had been fewer flight opportunities than originally anticipated and the cost of performing research in space, be it on manned or unmanned orbital platforms, was still excessive. With the availability of the International Space Station, that situation should improve. ADMATIS would provide the universal multizone crystallizator furnace for commercial use. It was expected that the furnace would support several crystal growth techniques on board the International Space Station.

GeoVille: experience in setting up a space applications company in Austria

34. The founder of GeoVille, Christian Hoffmann, provided suggestions on what needed to be considered when starting up a space company. Keeping a start-up space company alive was hard work: one needed to know all the players in the field and to work constantly to obtain new contracts. A disparity in the space sector was that defence and national security work still made up a fair share of the market. In some countries it was easier to gain access to such contracts, while companies in other countries were excluded from bidding. The space sector was also quite different from the e-commerce sector, which had experienced high growth rates in the past few years. For instance, the Earth observation sector still depended to a large extent on contracts issued by the public sector, as private investment was still not widespread. GeoVille is currently involved in a number of projects, among them the satellite-based mapping of carbon sequestration reservoirs as an input to the monitoring plan set up following the third session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, held in Kyoto, Japan, from 1 to 11 December 1997.

Integration of satellite and terrestrial broadband networks

35. Another example of space career opportunities was presented by Ulla Birnbacher of the Technical University of Graz, who was working on satellite communication projects in Graz, known as the space capital of Austria. Graz is host to a number of companies involved in space activities and to several university departments active in space research, among them the Department of Communications and Wave Propagation of the Technical University. The Department conducted joint research with industry to develop software and hardware for the integration of terrestrial and satellite-based broadband services. The presentation highlighted the possibilities for synergy between research institutions and commercial entities.

Getting involved in space

36. Limin Zhou, Chinese Academy of Space Technology (CAST), presented an in-depth review of challenges of maintaining a young and dynamic space workforce in China. China had been involved in space activities for nearly 30 years and had developed an impressive range of launch vehicles and launched more than 40 satellites. Space activities formed an important part of the country's economic development and satellites had been developed to provide services for communications and broadcasting, satellite meteorology, Earth observation and space research. China was facing a problem as regards attracting a sufficient number of skilled young people into the aerospace sector. While the first generation of experienced and qualified aerospace experts was retiring or about to retire, there were few middle-aged experts. New graduates from technological universities often changed jobs because of better pay elsewhere.

37. To attract a larger number of young people into the space sector, China was pursuing the following strategy:

(a) Extending efforts to draw young and promising students into the space sector;

(b) Enhancing the ability of existing institutes and academies to train space experts;

(c) Training experienced postgraduates and new students on the job;

(d) Letting young people do important work and promoting them to leading positions (e.g. development of key national projects);

(e) Creating excellent working conditions and providing good living environments.

38. More than 9,300 people were employed at CAST, with more than 60 per cent of them under the age of 35 and 50 per cent of these latter in senior professional posts.

AeroAstro experience in starting up a space company

39. Rick Fleeter, the founder and chief executive officer of AeroAstro, a micro- and nano-satellite company based in the United States, talked about his experience in starting up a space company. Over the past 11 years, AeroAstro had brought costs down so significantly that many applications never even considered previously were now practical. As an example, NASA could now fly microgravity missions in space for the price of a sounding rocket payload and companies could monitor their remote assets via the web for the cost of a set of Global Positioning System (GPS) receivers. AeroAstro offered products and services in two complementary areas, miniature spacecraft and communications.

United Nations Programme on Space Applications

40. The expert on Space Applications introduced the United Nations Programme on Space Applications. The Programme, established in 1971, was administered by the Office for Outer Space Affairs, the focal point of the efforts of the United Nations to promote international cooperation in the peaceful uses of outer space. The mandate of the programme also included the development of a fellowship programme for in-depth training and the stimulation of the growth of indigenous nuclei and an autonomous technological base.

41. To date the Programme had organized 112 training courses, workshops and conferences on various aspects of space technology applications. More than 6,000 people had participated in those events and more than 250 specialists had received in-depth education through the fellowship programme. Another main emphasis of the programme was the establishment of regional centres for space science and technology.

42. Pursuant to a recommendation of UNISPACE III, the Office for Outer Space Affairs had also become an active player in the promotion of activities for youth, to encourage interest in space activities among students and young scientists and engineers. Through various activities, the United Nations Programme on Space Applications should have a positive influence on the space careers of a large number of people around the world.

Panel discussion

43. Panellists from the public and private sectors described their own career aspirations as well as the reasons that had originally led them to pursue a space career. They also described their experiences and the barriers they had confronted. All of the panellists shared an interest in space activities that had started in their early childhood or youth. The importance of keeping and pursuing a vision was stressed. For several of the panellists, eventually working in a space-related area had been due to a particular set of circumstances, underlining that there were few structured paths to achieve that goal.

44. In pursuing a space career, networking was an important factor on the road to success. As a result of the commercialization of space activities, the situation for a space career was currently good. However, there were barriers that were not as evident in other economic sectors. The aerospace sector was not yet a sector with a free flow of experts as compared, for example, with the information technology sector. Nevertheless, the problem of a brain drain was being felt in emerging space nations, which therefore needed to implement policies to retain trained experts.

C. Sessions 5 and 6. The work of the Youth Advisory Council: results to date and reports by the working groups

Outreach, public awareness, education and youth opportunities: global education and outreach initiative

45. Since UNISPACE III, the Outreach and Public Awareness Working Group had been discussing ways in which it could help improve space education around

the world and, specifically, in developing countries. The idea of creating a space education curriculum framework had been put forward and had become the main focus of the group. The aim was to develop an outline that would be useful to different countries with different needs, as a guide for them to improve space education. This included a space information index—a comprehensive survey of global space education to be used as a reference and point of contact—as well as the identification of key components for successful space education.

46. Members of the Working Group and the Youth Advisory Council had tried to gain political support for the idea at events such as the International Astronautical Federation (IAF) Specialists' Symposium on "Bringing Space into Education", held in April 2000 in Bischenberg, France, and the thirty-seventh session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, in February 2000. Strong support was received from the international space community and the Working Group was encouraged to keep them informed of progress.

47. As a complement to the space education curriculum framework, an education and outreach programme entitled "Under African Skies" was adopted by the Working Group. Under that programme, an educational conference would be organized in Lusaka from 20 to 22 June 2001 to celebrate the first solar eclipse of the millennium in Africa. The conference would focus on science and technology education with an emphasis on astronomy, space exploration, the search for life in the universe and the benefits of space technology for developing nations. Before and after the conference, young people would travel to countries in southern Africa and teach space education from a well developed curriculum. The Office for Outer Space Affairs and the United Nations Programme on Space Applications supported the proposal as an example of the types of programme that sent people into the field to make a practical difference. Much enthusiasm and support were shown for the plan at the symposium and the first students will be sent to Africa by the summer of 2001.

48. The primary goals for the coming year were to prepare for the Lusaka conference by ensuring that all the necessary organizational matters were settled for students to start teaching in Africa, and to make significant progress with the space education curriculum framework. This would include liaison with international space organizations in order to compile the space information index, as well as surveying the state of space education in developing countries.

Policy, law and commercialization: space debris—responsible use of space resources in the twenty-first century

49. The goal of the Policy, Law and Commercialization Working Group is to discuss topics that affect space policy, encourage the development of and adherence to space law and legislation and influence the commercialization of the space industry. This Working Group will support the work of the Committee on the Peaceful Uses of Outer Space in areas involving international law as applied to space and space-related topics. The Group aims to elicit interesting ideas and novel solutions to many of the issues facing the future of space.

50. The unique vantage point of space for an Earth observation platform, the geostationary orbit and the microgravity conditions for experiments in space are examples of why space can be considered a resource. Since the establishment of the Working Group, discussions have focused on the issue of space debris, which represent not only operational hazards to spacecraft in orbit but also to human beings on Earth, when spent parts of a rocket stage fail to burn up on re-entry into the Earth's atmosphere. Early on in its discussions the Working Group discovered that the regulation of debris was still in an embryonic stage.

51. Other issues discussed included the creation of an international space authority, legal responsibility for the debris currently in orbit, the notion of mandatory insurance for bodies that place spacecraft into orbit, the need to minimize debris and campaigns to raise public awareness of the problem of space debris.

Science, technology and environment: science and technology, benefits for future generations

52. A synopsis of the recommendations of the Young Lunar Explorers session within the Youth Forum at the Fourth International Conference on the Exploration and Utilization of the Moon, held in Noordwijk, the Netherlands, from 10 to 15 July 2000, was presented and the creation of a group to develop and build a ground satellite receiver was proposed.

53. The Science, Technology and Environment Working Group discussed the concepts of the near space elevator (http://members.aol.com/beanstalkr/project) and the space elevator project (http://www.niac.usra.edu), putting special emphasis on new cheap access to space. It was proposed that the working group undertake the task of forming a focus group to study the feasibility of such a project. The ensuing discussion addressed the need for the Working Group to be well versed in many of the topics now in the forefront of related scientific research (e.g. space elevators, reusable launch vehicles, life in the universe and global climate change).

54. As a result of the first round table of the IAF Committee on Priorities for Space Activities in the twenty-first Century, held in Paris in March 2000, the Space Generation Forum/Space Generation Advisory Council was given several tasks to undertake in cooperation with the IAF initiative. An overview of the report, entitled "Mozambique as a Case Study for the Utility of Space Technology in Disaster Management", was presented. The report analyses the effectiveness of two specific uses of space technology (remote sensing and communications technology) during three different phases of the recent flooding disaster:

Phase 1. Recognize and reduce the impact;
Phase 2. React and rescue;
Phase 3. Rebuild, replant and rethink.

The conclusions of the report were discussed and the paper was made available to participants.

55. Ayseguel Özbakir (Turkey) gave a summary of her work on monitoring land use changes that were occurring as a result of illegal settlements in ecologically sensitive areas in Turkey. Her aim was to develop an environmental monitoring model capable of detecting changes in water resource areas, forested regions and other areas critical to the sustainability of the local ecosystems. The Elmali catchment area would be used as a case study because of its importance to the city of Istanbul.

56. Imran Majid (Pakistan) presented a summary of space-related activities in Pakistan. Of particular note was the well publicized celebration of the tenth anniversary of the launch of Pakistan's first satellite, BADR-1, developed and built entirely in Pakistan. The formation of the Youth Working Group of the Inter-Islamic Network on Space Sciences and Technology (ISNET) was announced. The Youth Working Group would focus on raising awareness of the potential that space holds for Pakistan and serve as a precursor and catalyst for the formation of an inter-Islamic space agency. The Group consists of students and young professionals from member States of the Organization of the Islamic Conference.

57. Patricio Figueredo (Argentina) gave a briefing of his current doctoral research at the Department of Planetary Sciences, Arizona State University, the focus of which is on Europa and the tidal motions of its icy crust. Pablo de Leon (Argentina) presented a synopsis of activities in South America and the current status of the Latin American Working Group. Student-built rocket projects were described and slides (by Fernando Stancato (Brazil)) were shown to demonstrate the success of those activities.

58. An example of a successful and enthusiastic initiative by young space experts was presented by Kevin Hand, of kSpace Education Inc., a small non-profit organization established in November 1999 and dedicated to promoting space education in developing countries. The initial objective of the organization was to visit schools throughout Africa to teach children about space. During January and February 2000, representatives of kSpace Education Inc. travelled from Johannesburg in South Africa to Nairobi, visiting 14 different schools and making 18 presentations on space exploration, the search for life in the universe and the application of space technology in developing countries. kSpace's next endeavour would be to organize an educational conference celebrating the first solar eclipse of the millennium in Africa (see para. 47), to be held in Lusaka from 20 to 22 June 2001 with local teachers and students from Zambia and neighbouring countries as participants.

59. Julia Birch, ESA, introduced the "Teach and Track" programme, an initiative supported by the ESA Outreach Office. "Teach and Track" will support European university students to go backpacking to developing countries, taking with them small autonomous satellite receivers to demonstrate to local schools the benefits of space technology.

60. Katiellon Gaptia Lawan, ACMAD, presented an information network, Ranet, that utilizes the Worldspace digital radio system. Ranet was developed to make possible easy distribution of environmental and meteorological information using the Worldspace small solar-powered radio stations. By attaching a

modem device to the radio, data can be downloaded from selected web sites and broadcast via the Worldspace Africastar satellite.

61. Short presentations on the recent establishment of the Space Research Working Group in Turkey, on a project to explore the feasibility of establishing an educational institution devoted to space research in Antarctica and on activities of the Canadian Alumni of the International Space University were made by Ayseguel Özbakir, Lisa Kaltenegger and Mark Dejmek respectively.

62. The Working Group identified several activities to be undertaken. It agreed to develop a database of the skills and interests of its members and an online database of presentations and information, including printable posters on an Internet web site. It also agreed that an effort should be made to invite as many relevant organizations and private companies as possible to set up links to the web site. Several issues in the field of science, technology and environment were suggested for consideration by subgroups, some of which would be explored in detail and a web-based document would be generated with the Group's findings and opinions.

63. It was proposed that a poster session be held during the 2001 symposium in Graz in order to allow participants to familiarize themselves with the work of their colleagues and to encourage collaboration. The Working Group agreed to work with the Outreach and Public Awareness Working Group in organizing the educational conference in Zambia (see para. 47). In addition to those activities, the Working Group decided to establish or continue the dialogue with participants of the International Forum of Young Scientists, organized by the United Nations Educational, Scientific and Cultural Organization in Budapest on 23 and 24 June 1999, the NASA Astrobiology Integration Office and ACMAD.

Space for sustainable development and meeting basic human needs: future directions for space and sustainable development

64. Protecting and improving the environment is becoming a necessity rather than a luxury. Future generations will not have an opportunity to live in a healthy environment unless the necessary precautions are taken. The basic resources that human society needs are water, food, clean air, shelter, energy, raw materials and living space. To achieve sustainable development, those resources should be well managed and people should be well educated in their effective use. Space technologies may be used to preserve such resources for future generations. The Space Generation Advisory Council will carry out activities to enhance the use of space technology for that purpose.

65. The creation of a multidisciplinary working group of young professionals to study uses of space technology that may help to achieve sustainable growth on Earth was discussed. Such a working group would interact with the United Nations Environment Programme (UNEP) and its Youth Advisory Council. It would create a database evaluating problems that various countries had with their basic resources and would identify groups of countries or regions with similar problems. The next step would be to design two or three feasible and cost-effective pilot projects that include information on available space technologies and proposals on how to solve and/or to mitigate those problems using space technology. The last step would be the implementation of the projects by the countries or regions concerned.

Philosophy, ethics, religion, social science, arts and humanities: philosophical objectives of human expansion into and uses of space

66. The Working Group in this area aims at promoting a global sense of the need for an international commitment to peaceful conflict resolution on Earth and for collaboration as humankind continues to move out into space. Ideas discussed in that context were a possible declaration of human rights in space, planetary defence (i.e. defence against the threat of asteroid impacts) and an inter-generational ethical forum. Actions identified by the Working Group during the symposium included the organization of a competition to predict the future of space technology mathematically, a discussion on entertainment of astronauts in space to alleviate the psychological problems associated with space missions of long duration and on the examination of the feasibility of putting an artist into space.

67. The idea of creating a philosophy booklet generated considerable interest and discussion. The idea had originated in on line forums shortly after the Space Generation Forum. The purpose of the project would be to develop a booklet entitled "Humanity's Goals in Space: The Point of View of the Space

Generation", a philosophical booklet on why humankind should go into space.

International cooperation and peacekeeping: ensuring that space remains free of weapons

68. The role of space technology in the fulfilment of the vital, strategic and power interests of a nation were discussed. Discussion focused on the militarization of space and the role of military and dual-use space technology. Since law sets the rules for policy, the limits of international law, in particular of space law, were discussed. Special consideration was given to the responsibility of the launching State and the creation of a system for mitagation of the effects of space debris.

69. A lack of awareness concerning policy and legal issues was identified, especially in relation to the demand for orbital slots and frequencies, as also a lack of education in the field of space policy and law. It was decided that the Working Group would make available on the Space Generation Advisory Council web site a presentation concerning basic issues of space policy and law. At the same time, a simple computer game would be created to illustrate the legal and political issues related to the launch of a satellite into orbit and a probe into deep space. In the long term, the Working Group planned to lobby for inclusion of courses on space policy and law in the curricula of schools teaching law, political science and engineering.

D. Session 7. Follow-up to the recommendations of UNISPACE III and formal establishment of the Space Generation Advisory Council

70. A representative of the Office for Outer Space Affairs made a presentation on the implementation of the recommendations of UNISPACE III. One of the initiatives of the Office was intended to increase the awareness of the general public of the importance of peaceful space activities in improving the common and social welfare of humanity and to provide more opportunities for children and young people to learn more about space science and technology.

Establishment of the Space Generation Advisory Council

71. Following the scheduled programme of work of the symposium, members of the interim Youth Advisory Council and its parent organization, UNEP, and participants of the Space Generation Forum and of the symposium held daily evening meetings to ensure that the statutes of a new organization to replace the Youth Advisory Council were sound and meaningful in relation to its mission. As a result, the statutes were adopted unanimously by the regional representatives of the Youth Advisory Council.

72. During discussions on the structure of the Council, a new name emerged that would symbolize the stature and heritage of the organization. Firstly, the Office of Outer Space Affairs agreed to make the Council an official advisor to the United Nations Programme on Space Applications. That endorsement associated the organization with the internationally recognized name of the United Nations. Secondly, it was decided to replace the word "Youth" with the words "Space Generation" to take advantage of the goodwill and respect associated with that name that had resulted from the success of the Space Generation Forum at UNISPACE III. As a result, the new organization was established as the United Nations Programme on Space Applications Space Generation Advisory Council.

73. A formal ceremony to recognize the removal of the interim status and the creation of a permanent body was held. A representative of each of the six regions of the world signed the declaration formally creating the new Council, including Tare Brisibe (Africa), Linda Parker (Asia and the Pacific), Virgiliu Pop (Europe), Mohammed Imran Majid (Middle East), Loretta Hidalgo (North America) and Patricio Figueredo (South America). The declaration of the new Council was also signed by the Expert on Space Applications and by the Executive Chairman of the Space Generation Forum

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

[2] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* (A/55/20), para. 36.

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Report on the United Nations/International Astronautical Federation Workshop on an Operational Strategy for Sustainable Development using Space

(São José dos Campos, Brazil, 28-30 September 2000)

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I. Introduction

A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) and the Vienna Declaration on Space and Human Development recommended that activities of the United Nations Programme on Space Applications promote collaborative participation among Member States at both the regional and international levels, emphasizing the development of knowledge and skills in developing countries.[1] At its forty-second session, in 1999, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposia and conferences planned for 2000.[2] Subsequently, the General Assembly, in its resolution 54/67 of 6 December 1999, endorsed the United Nations Programme on Space Applications for 2000.

2. The present report contains a summary of the presentations and discussions of the United Nations/International Astronautical Federation Workshop on an Operational Strategy for Sustainable Development using Space. Organized as part of the 2000 activities of the Office for Outer Space Affairs of the Secretariat under the United Nations Programme on Space Applications, the Workshop was co-sponsored by the European Space Agency (ESA), the Centre national d'études spatiales (CNES) of France, the Government of Brazil and the International Astronautical Federation (IAF). It was the tenth workshop of this series and was held in São José dos Campos, Brazil, in conjunction with the fifty-first Congress of IAF held in Rio de Janeiro. Organizational and programme support was provided locally by the National Institute for Space Research (INPE) of Brazil.

3. Space technology applications play an increasing role in international development efforts. New applications are constantly being developed in the fields of telecommunication, navigation and remote sensing. Earth observation data is the best available tool to study and monitor the global environment, including climate change, desertification, deforestation and agricultural and geological resources. The daily and global coverage of the planet provides precious information for environmental monitoring, natural resource management, disaster management and urban planning.

4. The potential benefits of space technology applications in developing countries are enormous. Satellite communications can be very efficient over large areas with only little ground infrastructure. Moreover, space technology can make a significant contribution to development in a region or country with a relatively small number of experienced professionals. Successful implementation of space technology applications has not yet taken place, however. Some major issues have to be resolved before this can happen. First of all, key policy and decision makers need to be convinced of the importance and benefits of space applications for their country in order to obtain political and financial support. Cost-benefit studies have to be undertaken to attract possible investors to provide funding for the implementation of operational use of space technology applications. To guarantee the lasting success of a given project, professionals and trained staff are required. The workshop addressed these and other issues while putting special emphasis on funding mechanisms for space-related projects in developing countries.

5. The present report covers the background and objectives of the workshop as well as presentations made, discussions held, observations made and conclusions reached by the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fourth session and to its Scientific and Technical Subcommittee at its thirty-eighth session, in 2001. The participants will report to the appropriate authorities in their own countries. The proceedings of the workshop, together with a list of participants, will be made available through the Office.

B. Programme

6. During the course of the workshop, successful examples of the use of space technology in tropical regions to monitor deforestation, semi-arid areas and urban issues were presented. In addition to the technical presentations, a separate session addressed funding and financing strategies. The workshop was organized in six sessions, at which 19 papers were presented. In addition, 17 participants from developing countries provided an insight into the status of space technology applications in their respective countries. The presentations were followed by panel discussions

that gave participants an opportunity to voice their opinions.

7. Presentations were made by INPE, the Centre de Suivi écologique (CSE) of Senegal, the Institute of Technology Bandung of Indonesia, the Royal Jordanian Geographic Centre, the Universidad de la República (Uruguay), CNES, the Inter-American Development Bank (IDB), the Royal Centre for Remote Sensing of Morocco, the Foundation for Space Applications of Ghana, the Pakistan Space and Upper Atmosphere Research Commission (SUPARCO), the Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales of Argentina, Surrey Satellite Technology Ltd. (United Kingdom of Great Britain and Northern Ireland), the IAF Power Committee, the Catholic University of Chile, the Centro de Levantamientos Aeroespaciales y Aplicaciones SIG para el Desarrollo Sostenible de los Recursos Naturales (CLAS) of Bolivia and the Office for Outer Space Affairs of the Secretariat.

8. Visits to the Laboratory for Integration and Testing, the Visitors Centre of INPE and the Centre for Weather Forecasts and Climate Studies (CPTEC) at Cachoeira Paulista were organized by the local organizing committee.

C. Attendance

9. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates for participation in the workshop. Selected participants were required to have a university degree or well-established professional working experience in a field related to the overall theme of the workshop. In addition, participants were selected on the basis of their working experience in programmes, projects or enterprises that were already using space technology applications or that could potentially benefit from using space technology. Special consideration was given to representatives of private industry and policy and decision makers.

10. Funds contributed by the Government of Brazil, the United Nations, ESA, CNES and IAF for the organization of the workshop were used to cover the international air travel and living expenses of 24 speakers and participants from developing countries. The co-sponsors also covered the cost of registration fees for participants from developing countries to participate in the 51st International Astronautical Congress, which was held immediately after the United Nations/IAF workshop.

11. The workshop was attended by 50 participants, from Argentina, Bolivia, Brazil, Canada, Chile, Colombia, the Czech Republic, Ecuador, France, Germany, Ghana, Greece, India, Indonesia, Japan, Jordan, Mexico, Morocco, Nicaragua, Pakistan, Peru, Romania, Senegal, the United Kingdom, the United States of America, Uruguay and Uzbekistan.

II. Observations and recommendations

12. During the panel discussions the participants expressed their views on many aspects of the use of space technology for sustainable development. The main observations and recommendations are summarized below.

13. In order to maximize the possibilities of funding, it was recommended that close cooperation be instituted at the regional level. Requirements for a development project to be successful in obtaining financial support were technical and economical sustainability and awareness of responsible decision makers.

14. As space technology applications were still very expensive, it was almost impossible for developing countries to maintain capacity and continue with work without the continued support of donor agencies or countries. It was therefore recommended that a development project create revenues to maintain the national capacity after the project was finalized.

15. Appropriate care should be taken to prepare documentation of development projects that could easily be used by politicians during the process of approval. The need was felt to put more emphasis on cost-benefit analysis of a project, since cost-effectiveness might persuade decision makers to support an initiative or project more than any other factor.

16. The participants stressed the need to involve local expertise in projects sponsored by the World Bank or international development banks. In order to improve communication between scientists, decision makers and donor agencies and to make scientists aware of the criteria that donor agencies applied in the selection of

projects, it was strongly recommended that presentations on funding and financing be included in future workshops.

17. The need to create awareness at the decision-making level was stressed. It was recommended that participating communities in developing countries be encouraged to organize, on a regular basis, training workshops/seminars with the objective of enhanced economic productivity, which should interest decision makers in the respective countries.

18. The information about free availability of the INPE Sistema de Processamento de Informacoes Geograficas (SPRING) software was appreciated and free distribution of similar software was encouraged. (See the report on the United Nations/ESA/Committee on Space Research Workshop on Data Analysis Techniques, held in São José dos Campos, Brazil from 10 to 14 November 1997 (A/AC.105/687).)

19. Operational sustainability requires the continued interest of end users who would like to have direct control of their natural resources. This in turn would require preparation and easy availability of databases and related technologies for use in the local environment. It is recommended that such a system be implemented at the local government/user's level and made available to users at no cost. Developing countries should be encouraged to set up such systems by provision of application software at a nominal cost.

20. To facilitate easy access to software for the development of various applications, the establishment of regional software banks, accessible via the Internet, may be required. These regularly updated software banks should keep track of the number and nature of users for sustainable development.

III. Summary of presentations

21. The workshop was opened with welcoming statements by the representative of the United Nations, the President of IAF and representatives of INPE, ESA, CNES and the Committee for Liaison with Industrialized Organizations with Developing Nations.

22. The two keynote addresses were given by T. Godai (IAF) and T. Krug (INPE). The first address, on promoting space utilization and sustainable global development through equal access to space information, introduced the theme of the workshop. In the second address, the speaker addressed the problem of deforestation, one of the most serious problems of Brazil. Subsequently, she presented an example of regional cooperation established during the Roraima fires in 1998. At that time the Cuiaba and Cotopaxi receiving stations collected data from both Land Remote Sensing Satellites (Landsat) and Defense Meteorological Satellite Program (DMSP) satellites.

A. Use of space technology in tropical regions

23. The representative of CSE (Senegal) provided an overview of the use of advanced information technology in west Africa in the field of natural resource management and environmental monitoring. It focused on the use of remote sensing in Senegal at CSE, one of the first institutions active in the field of remote sensing applications for environmental monitoring in Africa. Remote sensing is used in areas such as vegetation monitoring, agricultural statistics, crop yield forecasting, rainfall estimation, bush fire monitoring, land use and land cover mapping and environmental impact assessment. The representative highlighted the significant efforts undertaken in the use of modern technology to enhance access to and control over information and how that technology could contribute to the process of sustainable development.

24. The next presentation summarized satellite technology development for applications in Indonesia. Indonesian space activities have been directed primarily towards developing space technology applications as instruments for down-to-earth economic activities as well as environment monitoring and conservation. Awareness and initiatives in the private sector and universities to develop elements relevant for space technology applications for sustainable development, for telematics applications, for instance, have grown. In that regard, some activities related to the development of satellite technology have taken place and are intended to address the local and regional market as well as to support sustainable application of space technology in Indonesia, in particular remote sensing, communications and navigation for economic development.

B. Deforestation of tropical regions

25. The representative of Jordan informed the participants about geographic information system (GIS) modelling of land degradation in northern Jordan using satellite imagery. He presented a research project being conducted under the Badia Research and Development Programme. The programme aims to use satellite imagery to assess landcover change and GIS to evaluate land degradation.

26. A study on the impact of forest plantations on Uruguayan grasslands was presented by a representative of Chile, who is currently working on his doctoral thesis at the Universidad de la República in Uruguay. The main objective of the project is to understand the impact of replacing grassland with forests on different aspects of ecosystem functioning. The ecological impact of replacing grasslands with forests dominated by exotic species has not yet been evaluated as the change in the dominant plant functional group is occurring in the opposite direction to that in most areas of the world. The study combines remote sensing (Landsat Thematic Mapper), GIS, laboratory and field experiments and modelling (CENTURY model). The research strategy tries to fill the gap between large-scale (using space technology) and small-scale studies (classical ecological studies) to answer basic scientific questions.

27. The Amazon project has developed a new procedure to monitor and map deforestation in the Brazilian Amazon. The method is based on digital processing and supervised classification.

C. Funding and financing strategies for the operational use of space technology for sustainable development

28. The presentation by CNES focused on integrating existing funding mechanisms in the preparation of projects that include the use of space technology. The Congo Basin Rainforest Project represents a good example of a successful development project. The project is regional and is devoted to biomass conservation and sustainability.

29. Information technology is the current keyword for projects seeking support by funding banks. The presentation by the representative of IDB focused therefore on financing strategies for and experiences with projects using information technology for efficient, equitable and sustainable development. The goal is to seek avenues of cooperation with international organizations, civil society institutions and private sector enterprises to leverage the technical and financial resources available to promote the use and implementation of information technologies in the region. The Bank seeks to contribute to the efforts of its member countries in the region to attain sustainable use of the environment and of their natural resources by providing the technical and financial instruments necessary to achieve such goals and objectives in the short, medium and long term.

30. The constraints of remote sensing projects, as pointed out by the representative of the Royal Centre for Remote Sensing of Morocco, are reduced budgets, a lack of awareness among decision makers of the benefits of remote sensing techniques and the prohibitive costs of data acquisition. The Agrima project was presented as a successful project that combined the resources and expertise of different partners, allowing flexibility in financial management owing to the participation of the United Nations Development Programme and ensuring the durability of the results because of the high involvement of the partners. The successful implementation of remote sensing projects requires strong determination on the part of national policy makers, mechanisms for effective interaction between the various departments and agencies and competent technical experts.

31. The representative of Ghana presented the Ghana Environmental Resource Management Project, which was initiated after the United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992,[3] to develop an environmental dataset for the management of national resources. Five institutions were commissioned to develop the datasets. Funding for the project came from the Danish Agency for Development Assistance and the International Development Agency of the World Bank. A critical assessment of the positive and negative impacts of the project was made, with particular reference to the objectives set out in the terms of reference of the funding, the spin-off benefits of the project and the roles it played in building the sustainable institutional capacity in space technology projects.

D. Semi-arid areas

32. The representative of Pakistan dealt in his presentation with the use of space technology in monitoring and locating water resources in semi-arid regions.

33. The characteristics of the zonda winds in the central-western area of Argentina have been observed by the Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales and the results obtained on cloud formations observed with satellite images were presented. The method of analysis was considered an effective complement to prediction of the event performed with the use of mathematical-statistical models.

34. Another presentation focused on remote sensing applications using images from the China-Brazil Earth Resources Satellite.

35. New space possibilities were presented by the representative of Surrey Satellite Technology Ltd., who gave an overview of opportunities in space for developing countries.

36. A special presentation of the IAF Power Committee informed the participants about space solar power, the solar power satellite SPS-2000 project for equatorial countries and the Grand-Bassin Wireless Power Transportation operational project on the island of Réunion (France).

E. Urban issues and space

37. The presentation by the representative of Chile focused on the application of space remote sensing to urban studies on different working scales, focusing mainly on the use of high-resolution images. This allows for urban planning on a range of scales from a general overview or regional scale to a local or municipal scale. The use of space-borne sensors on board several satellites was analysed in terms of accuracy, land use information and cost-benefit relationship. A special advantage of the technology is the synergy between space remote sensing systems and geomatic tools, such as GIS. This is especially valid for developing countries where the lack of basic cartography is the main limitation for adequate urban and land use planning.

38. GIS is a useful tool for urban applications. A definition of GIS was given and its use for urban planning, environmental studies and cadaster applications was described. It was recommended that remote sensing/GIS projects be institutionalized and incorporated into municipal policies.

39. The last presentation of the session introduced the SPRING software used in geotechnology applied to urban planning. The software was made freely available to the participants.

F. Presentation of the recommendations of UNISPACE III and review of follow-up activities of previous United Nations/IAF workshops

40. The Office for Outer Space Affairs informed the participants about the recommendations of UNISPACE III and the steps undertaken by the Office to start implementation of those recommendations.

41. A second presentation focused on the development of an Internet-based information repository, a recommendation of the last United Nations/IAF workshop, held in Enschede, the Netherlands, in 1999 (see A/AC.105/733). In the meantime the Office for Outer Space Affairs has prepared an implementation plan and invited the participants of the 1999 workshop to submit their suggestions and comments as well as to participate in the implementation group. The National Aerospace Laboratory (NLR) of the Netherlands offered to make its "clubs" system freely available to the various United Nations bodies and its information supplying partners as well as for developing countries. A brief presentation of the "clubs" system followed.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1, para. 1 (e)(ii), and chap. II, para. 409 (d)(i).

[2] *Official Records of the General Assembly, Fifty-fourth Session, Supplement No. 20* and corrigendum (A/54/20 and Corr.1), para. 52.

[3] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda).